

SPHERES Mars Orbiting Sample Return External Orbiting Capture, Phase I

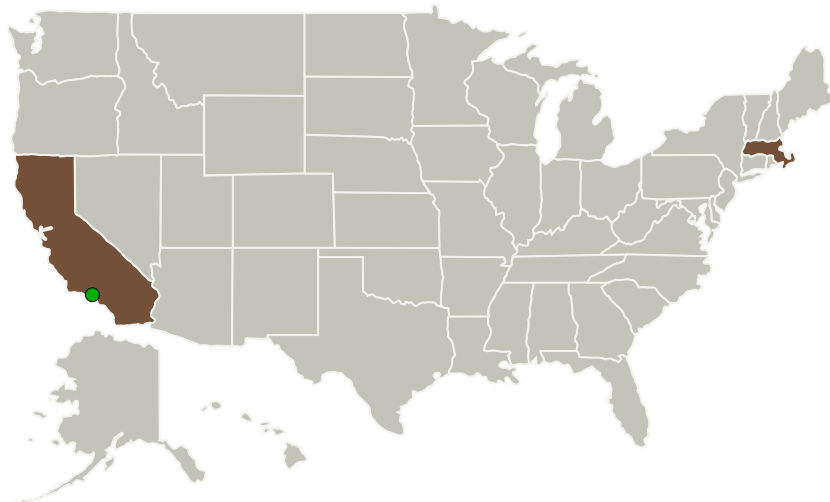
Completed Technology Project (2011 - 2011)



Project Introduction

NASA's Mars Sample Return (MSR) mission scenario utilizes a small Orbiting Sample (OS) satellite, launched from the surface of Mars, which will rendezvous with an Orbiter/Earth Return Vehicle (ERV). When the radio beacon-equipped OS is within range of the ERV's optical sensors, the ERV will optically track and approach the OS, maneuvering itself to place the OS within its capture device. One of the key technologies required to accomplish this mission involves a low-mass, highly reliable mechanism that detects contact with and captures the OS, and, once the OS is captured, moves the OS to a containment area for the return trip to Earth. There is an on-going body of research into such capture mechanism designs and the various advantages and challenges of these technologies. Aurora Flight Sciences and its research partner, the Massachusetts Institute of Technology (MIT) Space Systems Laboratory (SSL), propose to develop a flight-quality OS-detection and capture mechanism design based on research data and experience with the Mars Orbiting Sample Retrieval test bed and develop a risk-mitigation strategy that utilizes the International Space Station as a system checkout and launch platform for system testing in Low Earth Orbit (LEO). This proposal leverages the state-of-the-art research into sample capture mechanisms, contact dynamics and capture mechanism detection methods and builds on the team's experience with the Synchronized Position, Hold, Engage, and Reorient Experimental Satellites (SPHERES) system to develop a low cost, LEO test strategy that minimizes the risk for later Mars deployment.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Massachusetts

Project Transitions

▶ **February 2011:** Project Start

✔ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138523>)

Project Management

Program Director:

Jason L Kessler

Program Manager:

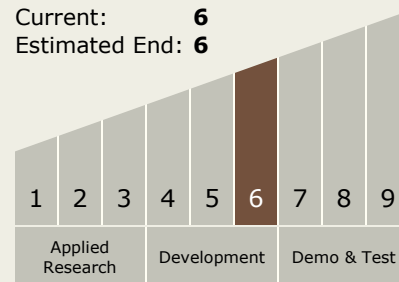
Carlos Torrez

Principal Investigator:

James D Francis

Technology Maturity
(TRL)

Start: 6
Current: 6
Estimated End: 6



Technology Areas

Primary:

- TX04 Robotic Systems
 - TX04.5 Autonomous Rendezvous and Docking
 - TX04.5.3 Rendezvous, Proximity Operations, & Capture (RPOC) Flight and Ground Systems

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Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System